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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Paper No. 24

Application Number: 09/369,767
Filing Date: August 06, 1999
Appellant(s): NEUMANN, HARALD

Richard L. Mayer
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 2-24-2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

Appellant's listed status of the claims is correct except for item 4. In paper no. 20, the examiner withdrew the rejection of claims 9 and 12 over Murase in view of Kato (see paragraph 7 of the examiner's Advisory Action). The corrected item 4 should read "Claims 1-8, 10, 11, 13 and 14 were rejected under 35 U.S.C 103(a) as unpatentable over U.S. Patent No. 5,413,683 to Murase et al in view of the Kato reference".

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

The appellant's grouping of the claims in the brief is correct.

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

4,909,922	Kato et al.	3-1990
4,629,549	Kojima et al.	12-1986

4,787,966	Nakajima et al.	11-1988
5,203,983	Ohyama et al.	4-1993
4,365,604	Sone	12-1982
4,400,260	Stahl et al.	8-1983
5,413,683	Murase et al.	5-1995

Logothetis et al. "High-Temperature Oxygen Sensors Based on Electrochemical Oxygen Pumping", Fundamentals and Applications of Chemical Sensors, ACS Symposium Series 309, 1986, pp. 136-154.

Liu et al, "Oxygen Sensors", Engineering Materials Handbook, vol. 4, Ceramics and Glasses, pp. 1131-1139.

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1 and 5-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato (4,909,922) in view of any of Kojima et al (4,629,549), Nakajima et al (4,787,966), Ohyama (5,203,983), and/or Sone (4,365,604) and with evidence by Logothetis et al ("High-temperature Oxygen Sensors", ACS Symposium Series).

Kato discloses an electrochemical sensor comprising a solid electrolyte element including a first electrode 22, a second electrode 24 in the reference duct 72, and a heating element 36 where the second electrode is situated closer to the heating element than the first electrode (fig. 7). In addition, Kato discloses in the embodiment of fig. 7 coupling the second electrode to the lower potential terminal of the heater element. Fig. 7 also shows the second electrode extending over the width of the reference duct. Although the lower potential element is not specified as

being ground, it is conventional in the art to utilize ground as the lower potential element. This is evidenced by the references Sone, Ohyama, Nakajima, and Kojima. These references are a sampling of the myriad of references available showing the conventional use of ground as a negative potential for the heater element. In particular, Sone teaches utilizing the automotive battery as the power source for the sensor components (fig. 4, and col. 8, lines 34-51). Because automotive batteries typically utilize ground as the negative terminal of the battery, it thereby follows that it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize ground as the negative terminal for any components powered by the automotive battery (such as the sensor of Kato) to simplify the electrical construction. The same use of ground as the negative potential of the battery can also be found in Nakajima (fig. 3), Kojima (fig. 2), and Ohyama (fig. 1). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize ground for the negative terminal of the heater as taught by Ohyama, Kojima, Nakajima, or Sone because the ground potential is a convenient lower potential available for a heater resulting in simpler electrical construction. Because it is obvious to ground the second electrode, and the first electrode would be at a lower potential than the second electrode due to the electromotive force (EMF) induced by the difference in oxygen partial pressure between the reference and exhaust gas, said first electrode would inherently be negatively polarized by induced EMF. In other words, when the oxygen partial pressure exposed to electrode 22 is lower than the oxygen partial pressure exposed to electrode 24, the potential at electrode 22 will be lower than the potential at electrode 24 (i.e. negatively polarized) (see equation 2 and fig. 1 of Logothetis for discussion of EMF).

With respect to the size of the electrodes, both Nakajima and Kojima set forth the use of electrodes which are all the same size. It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize electrodes which are the same size because the art already recognized the use of electrodes which are all the same size and such a modification would have involved a mere change in the size of a component. A change in size is generally recognized as being within the level of ordinary skill in the art. In re Rose, 105 USPQ 237 (CCPA 1955).

With respect to the electrolyte material, see (col. 10, lines 39-44). With respect to the heater voltage, the applied voltage is an intended use of the invention. Alternatively, although Kato ('922) does not explicitly specify the heater voltage applied, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize 12 volts since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, because automotive batteries are typically 12 volts, 12 volts is an obvious choice of voltage because it is an already readily available voltage level for the heater. With respect to the limitations calling for the second electrode to "additionally acts as a shield against coupling of heater voltage Uh", this limitation does not positively recite any further structure associated with sensor. Because the references rendered obvious the structure of the claim, this shielding property is inherent. The heater is also disclosed as being embedded in an electrical insulator (col. 8, lines 25 and 26).

Claims 2-4 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato ('922) and Ohyama, Kojima, Nakajima, or Sone in further view of Logothetis et al ("High-temperature Oxygen Sensors", ACS Symposium Series)

Kato disclosed all the limitations of the claims, but did not explicitly recite the use of operating voltages for the electrodes. Kato instead disclosed utilizing the sensor for the measurement of the induced electromotive force. Logothetis discloses that there are a number of advantages to operating the sensor with an induced current (as opposed to relying on the electromotive force), including that the output of the sensor becomes linearly proportional to the oxygen concentration in the gas (fig. 1, 2 and the associated discussion). This allows for wide sensing range (electromotive based sensors are typical only sensitive at a particular air-fuel ratio) and it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teachings of Logothetis for the invention of Kato to provide a sensor giving an output linearly proportional to the measured gas concentration. The teaching of applying a voltage across the electrodes of Kato would result in a negative voltage being applied to the first electrode 22 because Kato already rendered obvious grounding the second electrode which should be at a higher potential than that of first electrode (fig. 2 Logothetis) (hence the potential applied to 22 would be negative).

Claims 1, 7, 8, 10, 12-15, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stahl et al (4,400,260) in view of Ohyama, Kojima, Nakajima, or Sone and as evidenced by Logothetis.

Stahl discloses an electrochemical sensor which comprises a solid electrolyte element 25 with first and second electrodes (27, 29 respectively), a heating element 30, where the second

electrode 29 is situated closer to the heating element that the first electrode (fig. 4 and 5). Stahl also discloses connecting the second electrode 29 to a common element 33 with the negative lead of the heater. Although Stahl never discloses the common element to be at a ground potential, ground is a convenient potential available in the application of these electrochemical sensors (see discussion above with respect to Ohyama, Kojima, Nakajima, or Sone). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Ohyama, Kojima, Nakajima, or Sone with the sensor of Stahl because the prior art recognized the use of ground as a convenient lower potential for the heater. The use of ground as the lower potential for heater also simplifies circuit construction for the reasons set forth above (especially with respect to Sone). With respect to the polarization level of the first electrode, Stahl discloses operating the sensor in potentiometric mode (col.3, lines 11 and 12). In such an application, the polarization of the first electrode will be a function of the difference in oxygen levels in the gas being measured and in the reference passage. If the oxygen were greater in the measured portion than in the reference passage, the first electrode would be inherently negatively polarized (again, see discussion of EMF in Logothetis). Because the claim does not specify an operating condition where the measured gas concentration is less than the reference gas composition, Stahl would inherently meet the polarization limitation when the measured gas is of a greater concentration than the reference gas. The electrolyte of Stahl is zirconia (col. 3, line 13) and the heating element is placed on a protective coating (col. 5, lines 66-67). With respect to the heater voltage, the applied voltage is an intended use of the invention. Alternatively, although Stahl does not explicitly specify the heater voltage applied, it would have been obvious to one of ordinary skill in the art at the time the invention was being

made to utilize 12 volts since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, because automotive batteries are typically 12 volts, 12 volts is an obvious choice of voltage because it is an already readily available voltage level for the heater. With respect to the limitations calling for the second electrode to "additionally acts as a shield against coupling of heater voltage Uh", this limitation does not positively recite any further structure associated with sensor. Because the references rendered obvious the structure of the claim, this shielding property is inherent. The heater is also disclosed as being embedded in an electrical insulator (col. 8, lines 25 and 26).

With respect to the new limitations drawn to the use of an electrolyte tube, see col. 5, lines 16-26.

Claims 1-8, 10, 11, 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murase et al (5,413,683) in view of Kato (4,909,922).

Murase discloses an electrochemical sensor which comprises a solid electrolyte element 14 which includes a first electrode 32, a second electrode 30. Although not shown in the figures, Murase further discloses the use of a heating means for operating the sensor at elevated temperatures (col. 12, lines 32-35). Murase does not explicitly identify where the heating means would be located on the disclosed sensor, Kato teaches that it is conventional in the art to place the heater below the electrodes at a lower portion of the sensor (fig. 1-7). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Kato for the sensor Murase because placing the heater at the lower portion of the sensor has been identified as being a conventional location for sensor heaters. In this case, the

second electrode 30 would be situated closer to the heating element than the first electrode. In addition, Murase teaches coupling the second electrode to ground while negatively polarizing the first electrode by the application of a negative voltage with respect to ground. The negative voltage provided to the first electrode controls (powers) the measuring circuit (fig. 3 and associated discussion). The first and second electrodes have approximately the same sizes.

With respect to the choice of electrolyte, see col. 6, lines 14-15. With respect to the heater voltage, the applied voltage is an intended use of the invention. Alternatively, although Murase does not explicitly specify the heater voltage applied, it would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize 12 volts since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In addition, because automotive batteries are typically 12 volts, 12 volts is an obvious choice of voltage because it is an already readily available voltage level for the heater. The heater is also disclosed as being embedded in an electrical insulator (col. 8, lines 25 and 26). With respect to the limitations calling for the second electrode to "additionally acts as a shield against coupling of heater voltage Uh", this limitation does not positively recite any further structure associated with sensor. Because the references rendered obvious the structure of the claim, this shielding property is inherent. Kato taught embedding the heater into an insulating member (see discussion above).

Claims 15-20, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kato ('922) and Ohyama, Kojima, Nakajima, or Sone (with or without the teaching of

Logothetis) as applied to claims 1 and 21 above, and in further view of Liu et al ("Oxygen Sensors" from Engineered Materials Handbook, Vol. 4).

Claims 15-17, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murase in view of Kato as applied to claim 1 above, and further in view of Liu et al.

The references set forth all the limitations, but did not explicitly teach the use of a tubular solid electrolyte element. Liu teaches, in an oxygen sensor review, that oxygen sensors can be conventionally constructed using either planar elements (like those utilized by Kato and Murase) (fig. 1b) or a tubular configuration (fig. 1a) (see also fig. 3). It would have been obvious to one of ordinary skill in the art at the time the invention was being made to utilize the teaching of Liu for the sensors of Kato and Murase because the art recognized that tubular elements are an alternative form of sensor construction and the substitution of one known means of constructing a sensor for another, when the results are not unexpected, requires only routine skill in the art. With respect to Kato and the claims of 16-18, the use of a power source was already rendered obvious by the teaching of Logothetis (see rejection for claims 2-4, and 21).

(11) Response to Argument

As various points in the appellant urges that a number of the references are not from the field of the appellant's endeavor. This is unpersuasive because all the various references are drawn to electrochemical sensors for use as oxygen (i.e. air/fuel ratio) sensors in automotive exhaust gas lines. Moreover, all the references are drawn to electrochemical sensors constructed using solid electrolytes. This is precisely the same field of endeavor as that of the instant invention (see Background Information on p. 1 of the specification). In fact, Kato is drawn to an

arrangement where the second (or reference) electrode is tied to the same potential as the negative terminal of the heater source, which is *precisely* what the instant invention is teaching to do (compare fig. 7 of Kato with fig. 2 of the instant invention). Hence, all the various references are clearly from the same field of endeavor as that of the instant invention. Appellant is apparently alleging that these references are not from the same endeavor because they do not address the issue of blocking coupling from the heater voltage. First, the examiner points out that Kato is drawn to the blocking of leak current from the heater, which would appear to be the same issue as that drawn to the instant invention (see abstract of Kato). Second, the blocking of the coupling from the heater voltage would appear to be a result of the appellant's grounding of the second electrode. Hence, if the prior art renders obvious the grounding of the claimed second electrode, then it would thereby result in a sensor where coupling of the heater voltage would be blocked. It has been well settled that a patent cannot be granted for the discovery of a result that would have flowed logically from the teaching of the prior art. Finally, the claims under appeal are drawn to an apparatus and apparatus claims should be interpreted based on their structure (i.e. what they are) and not based on function (i.e. blocking heater coupling).

Appellant traverses the rejection of Kato in view of the secondary teachings of any of Sone, Ohyama, Nakajima, or Kojima based on the fact that none of the references *individually* teach coupling a second electrode to ground. However, the claims were not anticipated by these references, they were rendered obvious by the combination of the teaching of Kato in view of the various secondary teachings. To reiterate, Kato teaches coupling the second electrode to the negative lead of the heater, but Kato never specifies what the potential the negative lead of the heater should be connected to. However, a review of the prior art (i.e. the secondary teachings)

shows that the conventional potential to place the negative lead of the heater at is ground. The examiner would like to reiterate a point made in paragraph 16 of the previous final rejection (paper no. 18). Namely, that in the examiner's review of the prior art where the prior art *explicitly* suggested a potential to place the negative lead of the heater at, the examiner *never* found anyone utilizing a potential other that ground for said negative lead. The reference Sone offers us a reason why it is so obvious to utilize ground the negative lead. Namely that the heater is typically run off of the voltage from the car battery (col. 8, lines 34-51) and the grounding of the negative terminal of a car battery is a near universal practice in the automotive engine art (see fig. 4 of Sone).

Appellant continues to urge that the examiner is relying on an improper combination of the inherency and obviousness. However, appellant does not appear to have ever specifically laid out what is improper about the examiner's particular combination of obviousness and inherency, other than quoting case law, which the examiner does not believe is relevant to the issue at hand. In particular, the case law being cited is admonishing the office for stating that a claimed subject matter is obvious when the office already stated that subject matter is inherent. That is not what the examiner is doing. The examiner is stating that it would have been obvious to one of ordinary skill in the art at the time the invention was being made to ground the second electrode of Kato. The result of that grounding would be an inherently negatively polarized first electrode based on the principles of induced EMF across the first and second electrodes. For a simple analogy of this rejection, it would be like the examiner stating that it would have been *obvious* to one of ordinary skill in the art to paint something red and red objects *inherently*

absorb 700 nm light. Would this be an improper combination of obviousness and inherency? The examiner does not believe this would be the case.

With respect to the rejection of claim 5, appellant urges that drawings are not to scale. However, the figures show two identical elements (i.e. the electrodes) to be in proportion to each other irrespective of the exact scale of the drawing. In fact, the examiner believes the appellant is taking the issue of drawing scale to an improper extreme. Even though drawings are not to scale, individuals possessing ordinary skill in the art can still reasonably infer certain questions of scale from drawings (e.g. the electrolyte 3 of Kojima is larger than the electrodes 4 and 5). In the case of Nakajima and Kojima, when these two identical elements (i.e. the electrodes) are shown to be of substantially the same size, one possessing ordinary skill in the art would be reasonably motivated to construct these two elements to be the same size. Moreover, changes in size involve only routine skill in the art. The appellant does not appear to place any criticality on the use of same sized electrodes. The specification merely states that a larger electrode provides greater coupling. There does not appear to anything specifically critical about the use of same sized electrodes.

With respect to Stahl, appellant urges that the examiner has not appropriately interpreted what the potential at electrode 27 would be in the event that it were obvious to ground the negative heater lead. However, appellant's arguments are unpersuasive for a number of reasons. First, appellant points out from the evidentiary teaching of Logothetis that four electrons will transfer from electrode 2 to electrode 1. However, that condition in Logothetis is when the oxygen gas concentration at electrode 1 is *less* than the oxygen concentration at electrode 2. The examiner's example was the *exact opposite* condition, namely when oxygen gas concentration at

electrode 1 is *greater* than the oxygen concentration at electrode 2. Under these conditions, the electron flow will be reversed. Hence when P1 is *greater* than P2, then the electrons will flow towards electrode 2 and that electrode 2 will have the lower potential. Second, even if the appellant were correct in their assessment that the examiner was wrong in his interpretation of Stahl in view of the evidence from Logothetis, then the first electrode of Stahl would have a negative potential when the oxygen concentration exposed to first electrode were *less* than the oxygen concentration exposed to the second electrode. In other words, if the examiner is correct, when electrode 29 (i.e. the second electrode) is grounded, the potential experienced by electrode 27 (i.e. the first electrode) would float negative if the oxygen concentration exposed to electrode 27 were less than the oxygen concentration exposed to electrode 29. If the appellant is correct, when electrode 29 (i.e. the second electrode) is grounded, the potential experienced by electrode 27 (i.e. the first electrode) would float negative if the oxygen concentration exposed to electrode 27 were greater than the oxygen concentration exposed to electrode 29. Either way, a condition exists where the potential experienced by the first electrode would be negative (for the examiner, it's when the concentration is less; for appellant, it's when the concentration is greater). The claims make no conditions on what gas environments must be present when the first electrode must have a negative potential.

With respect to the rejection of Murase, appellant argues a number of features that Murase is lacking. However, the various features being referred to are not in the claims that Murase was being utilized against. For example, the appellant urges that Murase does not couple a reference electrode to ground. This is true, but the claims rejected over Murase do not specify anything about a reference electrode. These claims only specify a "second electrode" to be

coupled to ground. Electrode 30 of Murase would clearly read on the term "second electrode". Appellant also points out that element 16 cannot be read on the term reference duct. However, the examiner withdrew this rejection in the previous advisory action (see paragraph 7 of paper 20), and it is unclear why appellant is still arguing these points. Moreover, the claims being rejected over Murase specify nothing about a reference duct. Appellant also urges that there is nothing in Murase concerning similar sized electrodes when the figure clearly show electrodes of similar proportions. Moreover, the limitations drawn to similar sized electrodes only appear in one of the dependent claims. In fact, all the arguments appellant has concerning Murase do not appear to address anything in the independent claim 1. Whether or not the appellant is persuasive in any of these points does not obviate that the rejection utilizing Murase still would read on the independent claim and all but one of the dependent claims it is being utilized against.

Appellant has also provided on pp. 15-18 a number of general points concerning the examiner's burden to set forth a *prima facie* case of obviousness, or alleges that the examiner's rejection(s) constitutes an "obvious to try" rejection. However, these arguments are all general arguments and do not address any specific instance where the appellant believes the examiner has not sufficiently set forth a *prima facie* case of obviousness, nor the appellant provide any specific instance where they believe the examiner's rejection constitutes an "obvious to try". The examiner has never utilized the term "obvious to try" in the rejections of the claims, nor does the examiner believe any of the above rejections constitutes an unstated "obvious to try" rejection. Moreover, the examiner is of the opinion that an appropriate case of *prima facie* obviousness has been established in all of the above rejections and these general arguments are unpersuasive absent any specific points from the appellant concerning these rejections.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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